

# Large Scale Demonstration and Deployment Project (LSDDP)

## Fact Sheet

### Chicago Pile 5 Test Reactor Decommissioning at Argonne National Laboratory

In Partnership with the Office of Science and Technology (EM-50)

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#### Introduction

The Chicago Pile 5 (CP-5) test reactor is a heavy water moderated and cooled, highly enriched uranium-fueled thermal reactor designed to supply neutrons for research. Significant work in the Large Scale Demonstration and Deployment Project (LSDDP) included: removal of the reactor internals; removal of the biological shield; decontamination of fuel rod storage area; decontamination of radioactive material storage and handling facilities including the fuel pool; and decontamination and dismantlement of the building.

The implementation of an LSDDP, which fully integrates innovative technologies and management approaches, is critical to the Department of Energy-Environmental Management (DOE-EM) D&D mission.

#### Objective

The objective of the CP-5 LSDDP was to select innovative, field test ready decontamination and decommissioning (D&D) technologies, demonstrate those technologies in a large scale demonstration environment, and compare the results against existing commercial technologies. The intent of this comparison is to show that significant benefits can be achieved through the utilization of enhanced D&D technologies or to verify that existing technology practices are the most cost effective.

#### Technologies Demonstrated

**Advanced Recyclable Media System (ARMS):** The ARMS is an open blast technology which uses a soft recyclable media. This media consists of a urethane foam matrix, which can be manufactured, in various grades of abrasiveness.

**Centrifugal Shot Blast:** The Centrifugal Shot Blast system propels hardened steel shot at high velocities onto concrete floor surfaces. After the shot is propelled onto the floor, the resulting impact causes the cement to fracture into small pieces, which are then captured by an integrated dust collection system.

**Dual Arm Work Platform:** The Dual Arm Work Platform is designed to be suspended from a crane for remote positioning. The platform houses various electrical and hydraulic systems needed to operate the two Schilling manipulator arms and provides support for the tooling and end effectors. The current system can be operated by someone approximately 250 feet away without direct line-of-sight.

**Empore™ Membrane Separation Cartridge:** The Empore™ Cartridges membrane separation technology has been developed by 3M and provides a method for enmeshing sorbent surface-active particles in a web-like matrix. This technology provides the capability to remove contaminants down to detection levels at high flow rates.

**Field-Transportable Beta Counter-Spectrometer:** The PC-controlled, field-transportable beta counter-spectrometer uses solid scintillation, coincident counting, and low-noise photomultiplier tubes to count element-selective filters and other solid media.

**FRHAM-TEX Anti Contamination Suit:** The FRHAM-TEX COOL suit is a one piece, disposable, breathable, waterproof coverall. It is constructed of spun-bonded material that is then bonded to a butylene/poly hydrophilic film. This certified incinerable suit has a waterproof, leakproof zip-lock closure system.

**GammaCam™:** The GammaCam™ is a gamma-ray imaging system that is capable of measuring and mapping radiation fields. It produces a two-dimensional pseudo-color image of a radiation field superimposed on a corresponding black-and-white visual image.

**In-Situ Object Characterization System (ISOCS):** ISOCS, an in-situ gamma spectroscopy system, provides in situ, near real-time analytical data, including isotopic results.

**ROTO-PEEN Scaler and VAC-PAC® System:** The ROTO-PEEN Scaler and VAC-PAC® System is a method for removing contaminated coatings on concrete and steel located on floors, walls, ceilings, and structural components. The system uses a hand-held ROTO-PEEN scaler with localized exhaust. The debris removed by the ROTO-PEEN scaler is simultaneously collected in a VAC-PAC®, High



Performance HEPA Vacuum/Drumming System.

**Mobile Automated Characterization System (MACS):** MACS is a commercially-available, battery-powered, autonomous robot base supplemented by a laser positioning system and a scintillation detector array. MACS can detect alpha and beta contamination, and moves over floors at a speed of one inch per second.

**NuFab Anti Contamination Suit:** This suit is a one piece, disposable, breathable, waterproof coverall with a single front zipper. This sealed-seam suit is constructed of a tri-laminated composite material using spun bonded polypropylene and microporous film layers.

**Pegasus Coating Removal System:** The Pegasus Coating Removal System (PCRS) is a chemical-based coating removal system. Four types of PCRSs are available for application to alkyds, latex paints, epoxies, urethanes, chlorinated rubbers, elastomers, mastics, and other chemical-resistant coatings.

**Pipe Crawler™ Radiological Surveying System:** Pipe Crawler™ was developed for use as part of a turn-key pipe inspection, decontamination and survey service. The technology consists of a wheeled robot, or mule, on which is mounted an array of thin G-M detectors.

**Pipe Explorer™ Surveying System:** The Pipe Explorer™ system is an in situ deployment method for transporting a variety of survey tools into pipes and ducts. Tools available for use with the system include alpha, beta, and gamma radiation detectors; video cameras; and pipe locator beacons.

**Portable X-Ray Fluorescence Detector/HEPA Filter:** The portable Spectrace 9000 unit provides for non-destructive, real-time elemental analysis for solid, liquid, thin film, and powder samples.

**Remote Controlled Concrete Demolition System:** The Brokk™ Remote Controlled Concrete Demolition System uses a remotely operated articulated hydraulic boom with various tool head attachments. The machine is designed primarily to drive a hammer and has a reach of fifteen feet. The Brokk™ can be operated by someone 400 feet away or in a different room with a

TV monitor and can perform work up to a 30 degree gradient.

**Remotely Operated Scabbler:** Pentek, Inc.'s remotely operated scabbling technology, MOOSE®, is designed to scarify large concrete floors and slabs. The MOOSE® scabbler is comprised of three integral sub-systems: the scabbling head assembly, the on-board HEPA vacuum system, and the six-wheeled chassis.

**Rosie Mobile Robot Work System:** Rosie is a teleoperated system that allows a single operator to maneuver and work effectively from up to 500 feet away without direct line-of-sight.

**Rotary Peening with Captive Shot:** The technology uses Heavy Duty Roto Peen flaps to remove concrete and coatings from concrete floors. The system will shut off electrical power to the concrete planer should the detected vacuum drop below a safe threshold. Captive tungsten carbide shot, supported on flexible flaps, is rotated against the contaminated surface, mechanically fracturing coatings. The particles removed are simultaneously collected in a drum by a vacuum system.

**SRA Surface Contamination Monitor:** The Position Sensitive Radiation Monitor uses a position-sensitive gas-proportional counter to measure alpha and beta decontamination on floor surfaces. Survey data can be sampled in 5-cm square regions along the length of the monitor, which can be varied up to 5-m or longer.

**Starboldt™ Flashlamp System:** The Starboldt™ flashlamp system is a self-contained proprietary system for coatings removal and decontamination that uses xenon flashlamps to remove surface coatings from substrates.

**Swing-Reduced Control and Remote Crane Operation Upgrades:** The swing-reduced crane control system is designed to minimize the swinging induced in loads being moved by a crane and to enhance the operator's ability to control the remote positioning of loads. The No-Sway™ crane controller minimizes the amount that a load will swing when it is being moved by a crane. It also permits a crane operator to move the crane in precise steps without causing the swinging of the load.

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[http://www.netl.doe.gov/dd/project\\_sites/lstdp/cp-5/doc/cp5\\_website/index.html](http://www.netl.doe.gov/dd/project_sites/lstdp/cp-5/doc/cp5_website/index.html)

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